SIEMENS

SIMATIC NET PROFIBUS
Optical Link Module
OLM / P11 V4.0
OLM / P12 V4.0
OLM / P11 V4.0
OLM / G12 V4.0
OLM / G12-EEC V4.0
OLM / G11-1300 V4.0
OLM / G12-1300 V4.0

Operation manual

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Safety Guidelines

This operation manual contains notices which you should observe to ensure your own personal safety as well as to avoid property damage. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring to property damage only have no safety alert symbol. Depending on the danger level, the notices are displayed in descending order as follows.

Danger

indicates that death or severe personal injury will result if proper precautions are not taken.

Warning

indicates that death or severe personal injury may result if proper precautions are not taken.

Caution

with safety alert symbol indicates that minor personal injury can result if proper precautions are not taken.

Caution

without safety alert symbol indicates that property damage can result if proper precautions are not taken.

Notice

used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state.

When several danger levels apply, the notices of the highest level (lower number) are always displayed. If a notice refers to personal damages with the safety alert symbol, then another notice may be added warning of property damage.

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Siemens AG
Automation and Drives
Postfach 4848, D-90327 Nürnberg

Siemens AG 2007
Subject to technical modifications

Qualified Personnel

The device/system may only be set up and operated in conjunction with this documentation. Only qualified personnel should be allowed to install and work on the equipment. Only qualified personnel should be allowed to install and work on the equipment. Qualified personnel in the sense of the safety related notices of this documentation are persons who have the right to commission, ground and label devices, systems and electric circuits in accordance with the standards of the safety technology.

Intended use

Please observe to the following:

Warning

The device may only be used for the purposes designated in the catalog and in the technical description and may only be used in connection with third party devices and components recommended or approved by Siemens. The proper and safe operation of the product implies appropriate transportation, appropriate storing, positioning and assembly as well as accurate operation and maintenance.

Note: If the PROFIBUS OLM are supplied via extensive 24V supply lines or networks, actions against the injection of strong electro magnetic pulses into the supply lines have to be taken. These can occur for example by lightning strike or switching of heavy inductive loads. The robustness of the PROFIBUS OLM against electromagnetic interference is amongst others verified by the Surge Immunity Test according to EN61000-4-5. For this test, an over voltage protection for the voltage supply lines is necessary. For example the Dehn Blitzductor VT AD 24V Art. No. 918402 or an equal protection element are suitable. Manufacturer: DEHN+SÖHNE GmbH+Co.KG Hans Dehn Str.1 Postfach 1640 D-92306 Neumarkt, Germany

Brands

All names which are labeled with the trademark ® are incorporated brands of the Siemens AG. All other names in this script can be brands, whose use by third parties for their purposes can violate the rights of the owner.

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1 Preface

1.1 Preface

Purpose of the operation manual

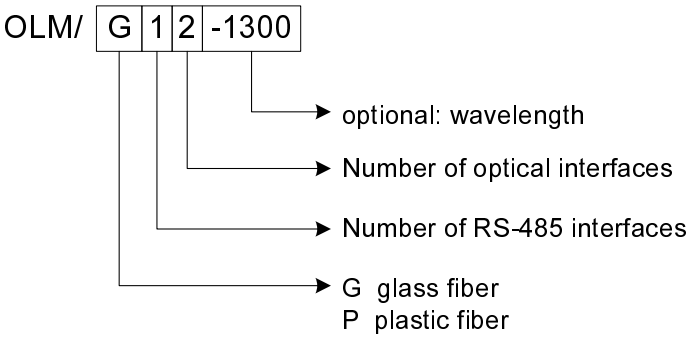
This operation manual supports you when commissioning PROFIBUS-OLM devices (Optical Link Module)

Area of validity of this operation manual

This operation manual is valid for the following devices:

SIMATIC NET OLM/P11 V4.0	6GK1 503-2CA00
SIMATIC NET OLM/P12 V4.0	6GK1 503-3CA00
SIMATIC NET OLM/G11 V4.0	6GK1 503-2CB00
SIMATIC NET OLM/G12 V4.0	6GK1 503-3CB00
SIMATIC NET OLM/G12-EEC V4.0	6GK1 503-3CD00
SIMATIC NET OLM/G11-1300 V4.0	6GK1 503-2CC00
SIMATIC NET OLM/G12-1300 V4.0	6GK1 503-3CC00

Glossary



Further Documentation

You can find additional tips on other SIMATIC NET products, which you can use with the OLM V4.0 devices, in the manual “SIMATIC NET PROFIBUS networks SIEMENS AG”.

Finding information

To help you find the information you require more quickly, the manual includes not only the table of contents but also the following sections in the Appendix:

- Glossary
- Index

Audience

This operation manual addresses persons involved in the commissioning of PROFIBUS networks with the link modules of the OLM V4.0 series.

Standards and Approvals

The devices of the OLM V4.0 series meet the requirements for the CE mark. For detailed information please refer to chapter 6 of this operation manual.

Additionally the devices of the OLM V4.0 meet the requirements for the UL, C-Tick, FM and ATEX marks. For detailed information please refer to chapter 6 of this operation manual.

2 Introduction

2.1 Introduction

This chapter gives an overview on the functions of the PROFIBUS OLM4.0 product family.

What Is Possible?

PROFIBUS OLMs are designed for the use in optical PROFIBUS field bus networks. They allow the conversion of electrical PROFIBUS interfaces (RS 485 level) into optical PROFIBUS interfaces and vice versa.
The modules can be integrated into existing PROFIBUS field bus networks – under utilization of the known advantages of the optical transmission technology. A complete set up of a PROFIBUS field bus network with modules in line, star or ring topology as well as any combination of these topologies is possible, as well.
To increase the protection of the field bus network against failure, the redundant ring is supported.

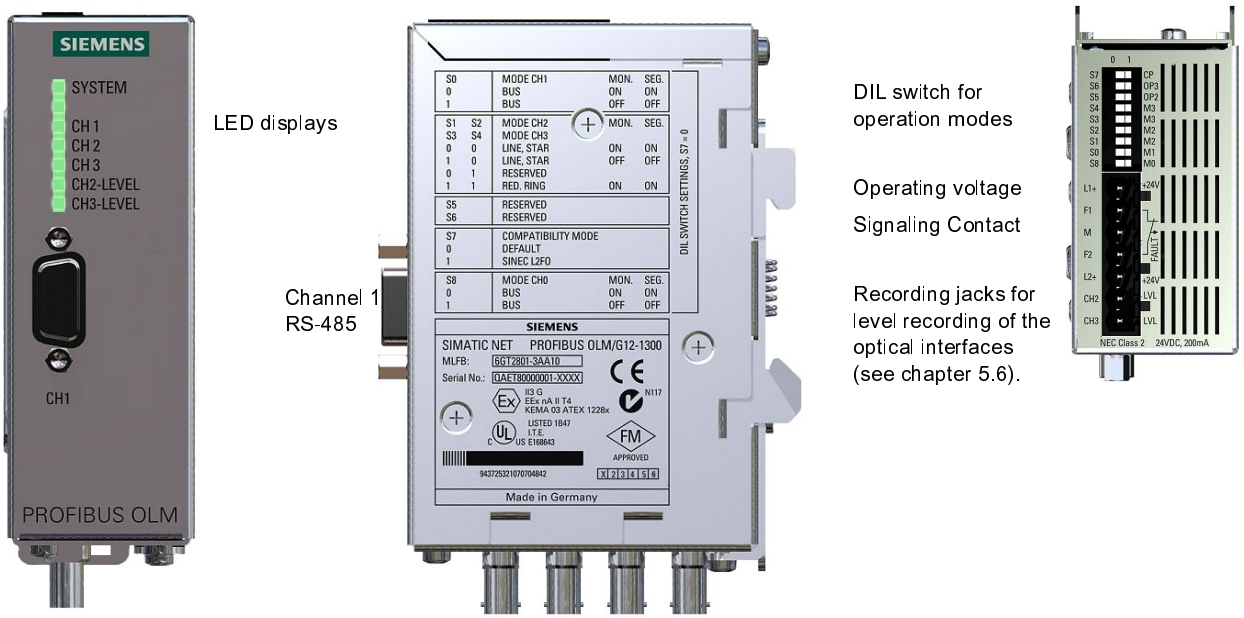


Figure 2-1 PROFIBUS OLM with position of all interfaces, displays and adjustment possibilities

Every module has two (OLM P11, G11) or three (OLM P12, G12) independent channels (ports), which consist of a transmission and a receiving unit.
The operation voltage supply is realized with 24 V DC voltage. To increase the operation safety a redundant feed is possible.

The electric channel is designed as 9-pin sub-D socket (female). A RS 485 bus segment according to PROFIBUS standard EN 50170 /2/ can be connected to this channel.
The fibre optic cables are connected via BFOC[1]/2,5 connectors.
Six multicolor LEDs show the current operation mode and possible operation failures as well as the level ratios on the optical interfaces.

Table 2-1 shows the different connection options of the modules and the maximum possible optical range of the single channels.

OLM/	P11	P12	G11	G12 G12-EEC	G11-1300	G12-1300
Number of channels						
-electrical	1	1	1	1	1	1
-optical	1	2	1	2	1	2
Fiber types that can be used						
- plastic fiber optic cables						
980/1000 µm	80 m	80 m	-	-	-	-
- PCF fiber optic cables						
(HCS®)	400 m	400 m	-	-	-	-
200/230 µm						
- silica glass fiber optic cables	-	-	-	-	15 km	15 km
10/125 µm (9/125µm)	-	-	3 km	3 km	10 km	10 km
50/125 µm	-	-	3 km	3 km	10 km	10 km
62.5/125 µm						

Table 2-1 Number of electrical and optical ports per module,
usable fiber types, as well as maximum achievable fiber optic cable distances between the modules. See the “Technical Data” for exact frame conditions. PCF stands for Polymer Cladded Fiber and is similar to HCS®[2].

There is a measurement output for every channel, at which the optical input level can be detected with a standard volt meter.

Different failure reports of the OLM are supplied as accumulative signal via a signaling contact (relais with floating contacts) for further processing. The single operation modes as well as failure notices are displayed through several multicolor LEDs at the front of the device (see chapter 5.7.1).

The mechanical design consists of a compact and stable metal housing which can be mounted either on a rail or on a mounting plate.

The configuration of the modules is realized via switches which are easy accessible from the outside.

[1] BFOC stands for Bajonett Fiber Optic Connector.
This type of connector is functionally compatible with ST connectors.
ST is a registered trademark of the company AT&T.

[2] HCS® is a brand of Ensign-Bickford Optics Company.

The PROFIBUS OLMs meet the requirements for the standard EN 50170 /2/ as well as for the technical directive “Optical transmission technology for PROFIBUS” which was edited by the PROFIBUS user organization (PNO).

OLM/G12 and OLM/G12-EEC have the same functions. They only differ in the specification of the climatic vicinity requirements: the OLM/G12 is suitable for the use in the standard temperature range from 0 °C to 60 °C, whereas the OLM/G12-EEC (extended environmental conditions) can be used in the extended temperature range of – 20 °C to +60 °C and up to 100% humidity (condensating).

3 Network Topologies

Which network topologies can be implemented?

The following network topologies can be realized with the PROFIBUS OLM:

- Point to point connection
- Bus Topology
- Star Topology
- Redundant optical ring

Combinations of this basic types are possible as well. For the setup of the fiber optic cables of these network topologies, lines with two optical fibers are used.

If in the case of failure – e.g. break of a fiber optic cable – a higher protection of the field bus against failure is necessary, the availability of the network can be increased by redundant network configuration.

Please observe:

- Single DTEs or complete PROFIBUS segments with a maximum of 31 recipients can be connected to the electrical interface of the PROFIBUS OLM.
- Only pass fiber optic cables in heavily EMC endangered areas to avoid EMC influences into the whole network.
- Optically **only OLMs of the same wave length** may be connected with each other:
  - OLM/P11 and OLM/P12 with each other
  - OLM/G11 and OLM/G12 as well as OLM/G12 EEC with each other
  - OLM/G11-1300 and OLM/G12-1300 with each other
- Optical channels which are connected via fiber-optic cables must be set to the same operation mode.
- Transitions between different OLM types are only possible via the RS485 interface.
- In the subsequently described network topologies, OLM/G12-EEC can be used everywhere, where also a OLM/G12 can be used.

3.1 Bus Topology

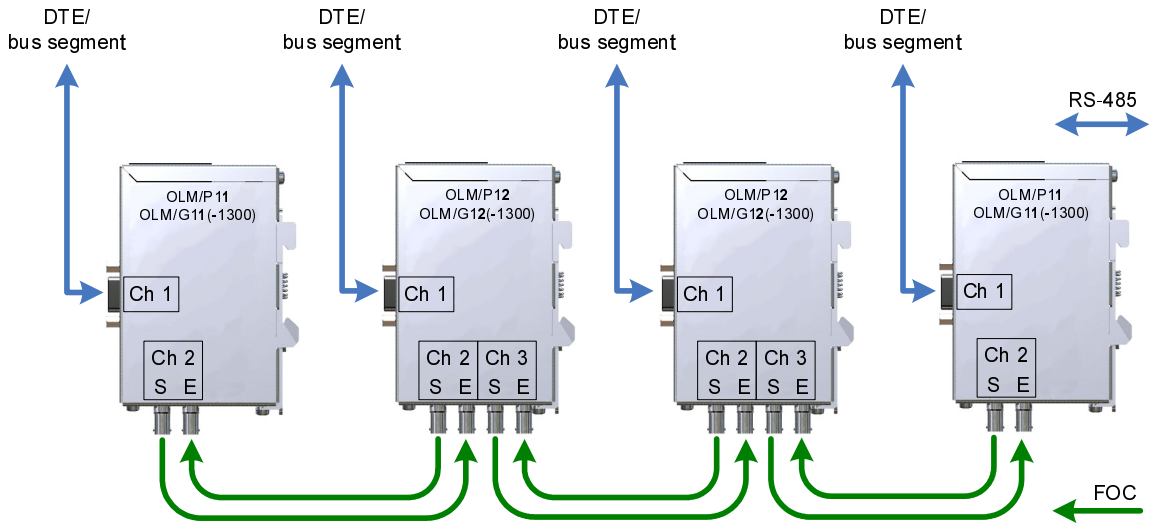


Figure 3-1 Network structure in optical bus topology

In a bus structure the single PROFIBUS OLMs are connected with two-core fiber optic cables.
At the beginning and at the end of a bus, modules with one optical channel are enough, in-between modules with two optical channels are necessary.

If single point-to-point connections have to be set up, they can be realized with modules with one optical channel each.

The bus topology can be realized with and without fiber optic cable distance monitoring. If within a fiber optic cable bus both operation modes are used, the operation mode “bus topology without fiber optic cable distance monitoring” determines the availability of this fiber optic cable bus. It is recommended to use the fiber optic cable distance monitoring in homogeneous OLM-networks (factory-made preset).

Please observe that to ensure a correct operation, it is necessary to meet the following frame conditions during the configuration of the network:

- The parameter MIN TSDR, described in the PROFIBUS standard EN 50170 /2/, has to be set to a value ≥ 11 at all DTEs. This is usually the case but has to be checked in case of occurance of permanent communication problems.
- Choose the lowest possible bus participant addresses when configuring your network, to keep possible occuring master timeouts low in the case of failure.

How the setting is to be changed can be found in the documentation of the manufacturer supplied with the DTE that is connected.

3.1.1 Bus topology with fiber optic cable distance monitoring and segmentation

Use this operation mode especially when a distorted fiber optic cable segment shall be seperated from the rest of the network (see chapter 4.2.2.4). Only use this operation mode, if you connect PROFIBUS OLM V4.0 or V3/V4.0 with each other only.

Monitoring mechanisms:

- Send echo: yes
- Monitor echo: yes
- Suppress echo: yes
- Monitor: yes
- Segmentation: yes

In this operation mode the monitoring of the single fiber optic cables is done by the two connected modules.

In case a module breaks down or a fiber optic cable breaks or disturbances on the optical transmission line are detected, the fiber optic cable between the two OLMs is interrupted (segmented). The PROFIBUS network falls apart into two part networks which -each one for itself- stay functional. The failure is displayed by switching of the channel LEDs to red and by activation of the reporting contacts of the two OLMs connected to the disturbed fiber optic cable. The segmentation is nullified automatically as soon as both modules recognize the segmented field bus part network as failure free by means of independently sent test telegrams. Observe that in networks with several active bus participants two logical token rings occur in the case of failure. Thus temporary network disturbances because of double tokens or telegram collisions can occur with every interconnection of the two part networks.

Note:

If at the beginning or at the end of a bus modules with two optical channels are used, the vacant optical channel has to be set to the operation mode “bus without fiber optic cable distance monitoring”, so that it does not lead to a fiber optic cable break signalization (see chapter 4.2.2.4). Observe that the optical channels which are not connected have to be protected against external light and pollution by means of protective caps.

3.1.2 Bus topologies without fiber optic cable distance monitoring

Use this operation mode when connecting a PROFIBUS OLM with another fiber optic cable component according to PROFIBUS directive (optical/electrical converter), which does not send a telegram echo and does not expect or tolerate a telegram echo.

Monitoring mechanisms:

- Send echo: no
- Monitor echo: no
- Suppress echo: no
- Monitor: no
- Segmentation: no

In this operation mode no monitoring of the single fiber optic cables is carried out.

3.2 Star Topology

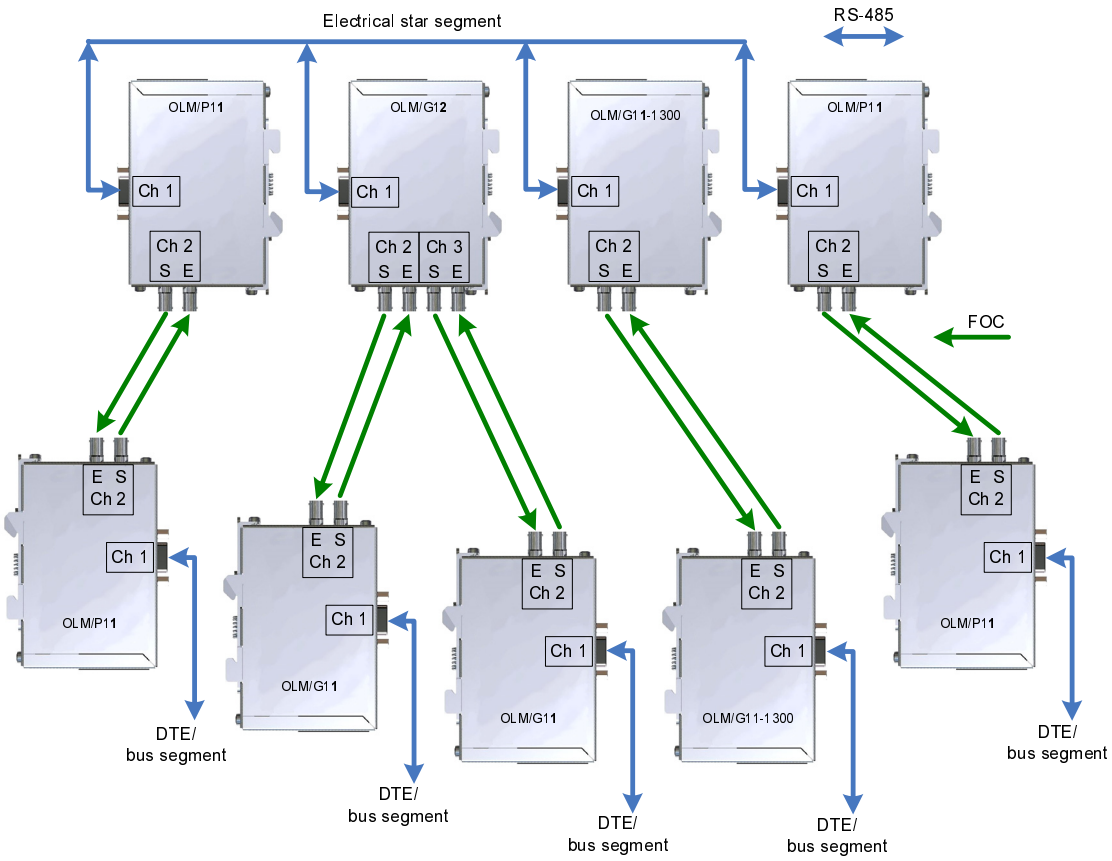


Figure 3-2 Network structure in optical star topology

Several modules are summed up to an active PROFIBUS star coupler. Further modules are connected to it via two-core fiber optic cables. The modules of the star coupler are interconnected via the electrical channel (electrical star segment). All OLM types for different fiber optic cables (plastic, PCF, glass) can be combined via the electrical star segment.

Please observe:

- CH1 has to be set to “Monitor off” (S0 = 1) at all OLMs, which are connected to the electrical star segment. Thus the segmentation function of the RS 485 channel of this OLM is turned off to keep up a high availability of the electrical star.
- Make sure that the electrical star segment is accurately wired. Keep its dimensions as small as possible to avoid disturbing injections into the electrical star segment and from here into the whole network. You can achieve this by positioning the OLMs directly next to each other on a rail.
- Switch on the terminating resistors (see chapter 5.3) in the bus connectors at the two ends of the electrical star segments.
- If possible do not connect bus participants to the electrical star segment.

For the setup of a active PROFIBUS star coupler modules with one or two optic channels can be used. For the connection of a DTE or of a RS 485 bus segment to an active star coupler, modules with one optical channel are enough.

When the distance monitoring on the optical channels is on, a monitoring of the fiber optic cables by means of the respectively connected OLMs is given.

Note:

Vacant optical channels, which are for example intended for possible later extensions, lead to a fiber optic cable break signalization when the distance monitoring is on. You can avoid this error message by switching vacant channels to the operation mode “bus without fiber optic cable distance monitoring”. Observe that the optical channels which are not connected have to be protected against external light and pollution by means of protective caps.

3.3 Ring Topology

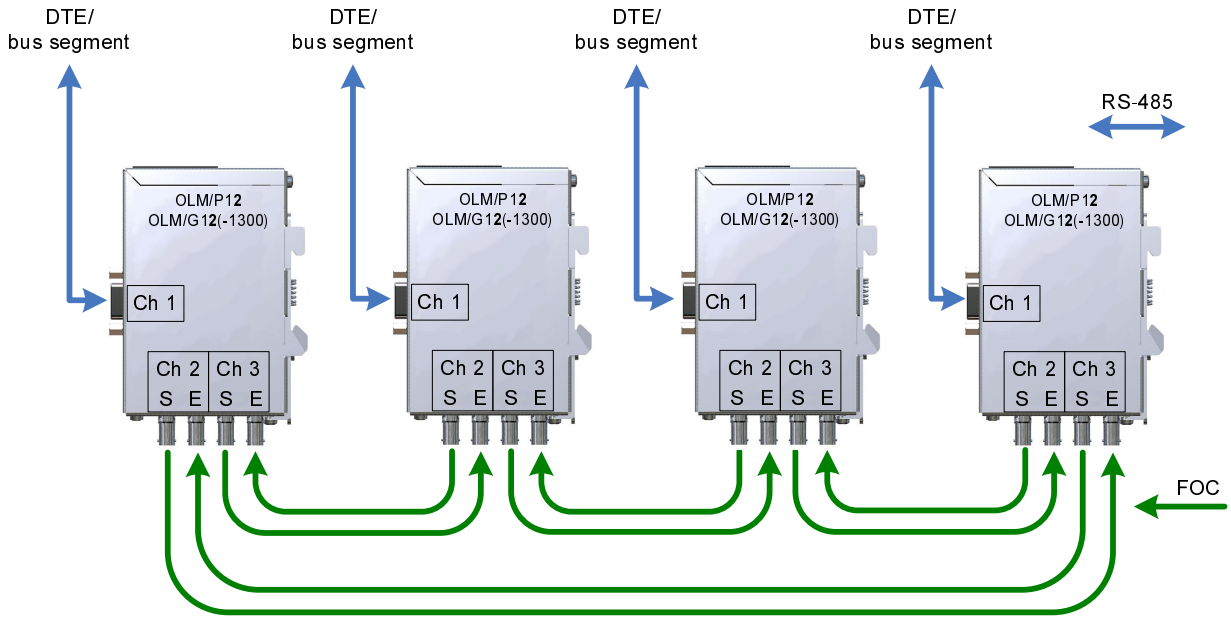


Figure 3-3 Network structure in redundant optical ring topology

This network topology is a special form of the bus topology. By “closing” of the optical bus, a high operation safety of the network is achieved. A redundant optical ring can only be realized by means of modules with two optical channels.

Monitoring mechanisms:

- Send echo: yes
- Monitor echo: yes
- Suppress echo: yes
- Segmentation: yes

The interruption of one or both fiber optic cables between the modules is detected by the OLM and the ring will become an optical bus.

If one module breaks down, only the DTEs connected to this module or the RS 485 segment are disconnected from the ring. The rest of the network itself stays functional as bus. The error message is displayed by the LEDs of the two OLMs connected to the distorted fiber optic cables and by the signaling contacts of these OLMs. The segmentation is nullified automatically as soon as both modules recognize the segmented field bus part network as failure free by means of independently sent test telegrams. The bus will close again to a ring.

Please observe:

For a correct operation the following frame conditions have to be met:

- Only use this operation mode, if you optically connect PROFIBUS OLM with at least Version V3 with each other only. Both optical channels have to be set to the operation mode “redundant optical ring” at all PROFIBUS OLMs. All modules within a ring have to be connected via fiber optical cables with each other. There must be no RS 485 bus line within the ring.
- The parameter MIN TSDR, described in the PROFIBUS standard EN 50170 /2/, has to be set to a value ≥ 11 at all DTEs. This is usually the case but has to be checked in case of occurance of permanent communication problems.
- Choose the lowest possible bus participant addresses when configuring your network, to keep possible occuring master timeouts low in the case of failure.
- In case of redundancy (e.g. cable break) a switching time occurs, during which a correct data transmission is not possible. To assure a shock-free bridging for the application, it is recommended to set the telegram retry number (retry) at the PROFIBUS master to at least 3. To assure a shock free switching back of the optical bus to the optical ring, after the clearance of an error, no telegram must be in the network at the same time. This status occurs, when the master sends a GAP query to an address below the HSA. The master tries to address the device in cycles and waits only till the rundown of the configured slot time, if he gets an answer or not (“GAP query”). The OLM recognizes this status an closes the optical bus to an optical ring in the middle of this query sequence. As a result the **following two important requirements for the configuration** of the redundant optical ring must be given:
  - The value of the parameter HSA (Highest Station Address) has to be set in a way, that between bus address 0 and the value HSA at least one address is not occupied by a bus participant, at all DTEs, this means there has to be at least one address gap. You can simply achieve this address gap by setting the HSA value to a level at least one higher than the highest occuring bus participant number.

Notice

If this requirement is not given or not given anymore, the optical bus will not close to a redundant optical ring anymore, after a segmentation. In this case the error message (LED and signaling contact) of the two respective OLMs will not be nullified after the clearing of the error, as well.

  - The slot time must be set to about a double of the value that would be valid in a redundant network. See chapter 5.10 for further information. How the setting is to be changed can be found in the documentation of the DTE or in the configuration software.

Notice

At a OLM, **no** glass fiber optic cable may be connected to a plastic fiber optic cable and vice versa.

3.3.1 Redundant Optical Ring with two OLMs

The setup of a redundant optical ring with two PROFIBUS OLMs can be seen as special case of the redundant optical ring and can be realized with the following two configurations.

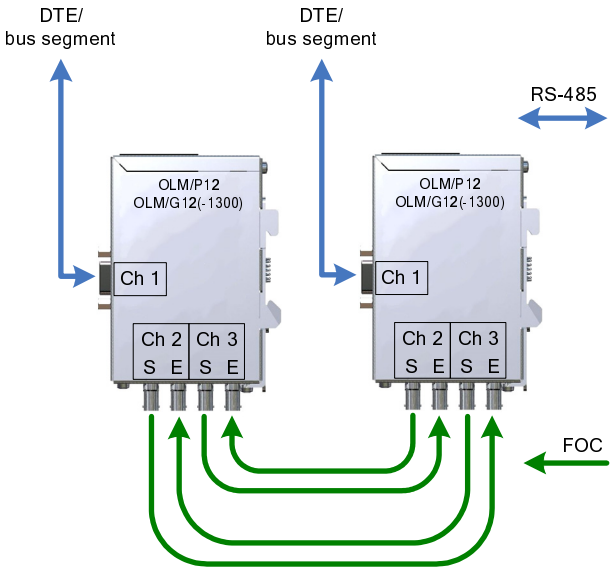


Figure 3-2
configuration 1

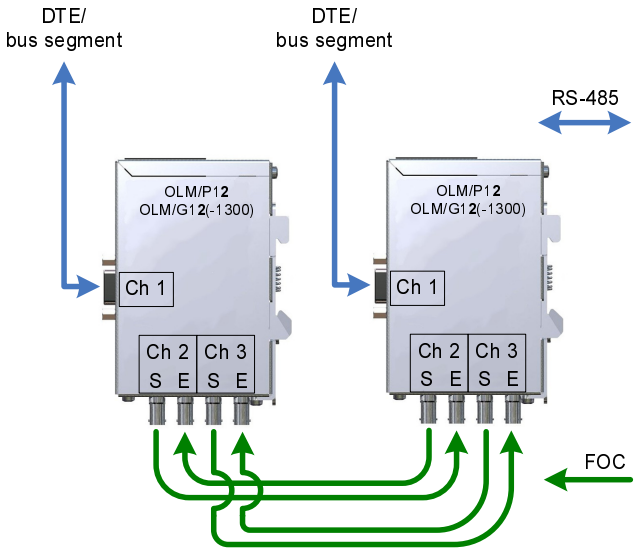


Figure 3-1
configuration 2

Display behaviour of the LED in the redundant optical ring:
A telegram recieved by any channel will be passed on to all other channels. If the telegram was recieved at an optical channel, it will also be sent back to the sender, in the same channel, as an echo and therfore serves as monitoring telegram to test the fiber optic cables between the OLMs.
The OLM also detects, if a received telegram is an echo or a telegram, that was passed on. In the case of an echo telegram, the channel LED stays dark whereas in the case of a passed on telegram it will illuminate yellow. In networks with more than two OLMs echo telegrams and passed on telegrams will alternate quickly. Because of the display-time prolongation to at least 300 ms all channel LEDs seem to be yellow agleam.
A different display behaviour of the channel LEDs of the redundant optical ring can only occur under the following frame conditions:

1. The redundant optical ring consists of exactly two OLMs and both fiber optic cable connections are of different length (difference > approx. 2m).
Under these conditions, it is the case, that the receiving OLM will receive a sent telegram always in the channel with the shorter fiber optic cable connection first. The channel will signalize this with a yellow gleaming LED. The telegram at the other optical channel is taken as “echo telegram”, the channel LED stays dark. Because of the fiber-optic cable dimensions being static, the display behaviour will remain static, too.

- **Configuration 1 (see Figure 3-2**
- configuration 1, **fiber-optic cable1 < fiber-optic cable2) , LED-display:**

1. Operation mode, no fiber-optic cable interruption:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow	CH1 LED = lit yellow
CH2 LED = lit yellow	CH2 LED = is not lit
CH3 LED = is not lit	CH3 LED = lit yellow

2. Fault, fiber-optic cable1 interrupted:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow	CH1 LED = lit yellow
CH2 LED = lit red	CH2 LED = lit yellow
CH3 LED = lit yellow	CH3 LED = lit red

3. Fault, fiber-optic cable2 interrupted:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow	CH1 LED = lit yellow
CH2 LED = lit yellow	CH2 LED = lit red
CH3 LED = lit red	CH3 LED = lit yellow

- **Configuration 2 (see Figure 3-1**

- configuration 2, **fiber-optic cable1 < fiber-optic cable2) , LED-display:**

1. Operation mode, no fiber-optic cable interruption:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow	CH1 LED = lit yellow
CH2 LED = lit yellow	CH2 LED = lit yellow
CH3 LED = is not lit	CH3 LED = is not lit

2. Fault, fiber-optic cable1 interrupted:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow	CH1 LED = lit yellow
CH2 LED = lit red	CH2 LED = lit red
CH3 LED = lit yellow	CH3 LED = lit yellow

3. Fault, fiber-optic cable2 interrupted:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow	CH1 LED = lit yellow
CH2 LED = lit yellow	CH2 LED = lit yellow
CH3 LED = lit red	CH3 LED = lit red

2. The redundant optical ring consists of exactly two OLMs and both fiber- optic cable connections are of exactly the same length.
Under these circumstances it is the case that the receiving OLM receives a telegram at both of the optical channels at the same time. To manage this case, the OLM prioritizes the two optical channels. By definition the telegram of the one optical channel will then be taken as echo (channel LED = off) and the telegram of the other optical channel will then be taken as passed-on telegram (channel LED = yellow).
It may occur that because of jitter influences and the resulting scanning differences between the two optical input channels alternately the one or the other optical channel will receive a telegram before the other. Because of the display-time prolongation to at least 300 ms all channel LEDs seem to be yellow lit then.

- **Configuration 1/2 (fiber-optic cable1 = fiber-optic cable2), LED display A:**

1. Operation mode, no fiber-optic cable interruption:

OLM 1	OLM 2
SystemLED = lit green	SystemLED = lit green
CH1 LED = lit yellow (continuous light, blinking,flickering)	CH1 LED = lit yellow (continuous light, blinking,flickering)
CH2 LED = lit yellow (continuous light, blinking,flickering)	CH2 LED = lit yellow (continuous light, blinking,flickering)
CH3 LED = lit yellow (continuous light, blinking,flickering)	CH3 LED = lit yellow (continuous light, blinking,flickering)

2. Fault, fiber-optic cable1 interrupted:

see above

3. Fault, fiber-optic cable 2 interrupted

see above

Generally:
No matter if a channel LED is lit or not, all optical channels are monitored continuously in the redundant optical ring. If a channel LED is not lit, the telegrams which run on this channel are used for the monitoring of the transmission line. The productivity communication is realized via the channel with the yellow lit display.

Faults are invariably displayed by a red lit channel LED and by the signaling contact. We recommend to connect the signaling contact for a safe monitoring of the OLM.

4 Product Characteristics

4.1 Technical data

Characteristics	Device type		
	OLM P11 V4.0 OLM P12 V4.0	OLM G11 V4.0 OLM G12 V4.0 OLM G12-EEC V4.0	OLM G11-1300 V4.0 OLM G12-1300 V4.0
Power supply			
Operating voltage	24 VDC protection low voltage permitted voltage range 18..32 VDC NEC Class 2		
Current consumption	max. 200 mA		
Output voltage for bus connection end RS-485 (Sub-D jack, Pin6)	5 VDC+5/-10%,		
Signaling Contact			
Function	floating contact, opens in case of error		
Voltage	CE: max. 50 VDC/30 VAC protective low voltage cULus: max. 30 VDC/30 VAC protective low voltage		
Current	max 1.0 A		
Signal transmission			
Transmission rate	9,6; 19,2; 45,45; 93,75; 187,5; 500 kbit/s 1,5; 3; 6; 12 Mbit/s		
Setting transmission rate	automatically		
Bit error rate	$<10^{-9}$		
Signal run thruogh time (any given in/output)	≤ 6.5 t_{Bit}		
Retimer			
Input (all channels) Signal distortion Bit length	 ± 30% ± 0.12%		
Output (all channels) Average bit length	 ± 0.01%		
Status signaling			
Device	LED “system”, red/green together with signaling contact		
Electrical channel	LED yellow/red		
Optical channels	LED yellow/red		
Optical level	level display with green/yellow/red LED		
Safety			
IEC regulation	IEC 60950 (corresponds with EN 60950 and VDE 0805)		
UL-approval	according to type plate		
CSA-approval	according to type plate		

Characteristics	Device type		
C-Tick approval	according to type plate		
FM approval	according to type plate		
Ex approval	according to type plate		
Electrical channel			
Type	RS-485		
Input voltage stability	-7 V..+12 V		
Optical channels	OLM P11 V4.0 OLM P12 V4.0	OLM G11 V4.0 OLM G12 V4.0 OLM G12-EEC V4.0	OLM G11-1300 V4.0 OLM G12-1300 V4.0
Wavelength	660 nm	850 nm	1300 nm
Optical power that can be injected			
in glass fiber **E 10/125 (9/125)**	-	-	-19 dBm
in glass fiber **G 50/125**	-	-16 dBm	-17 dBm
in glass fiber **G 62.5/125**	-	-13 dBm	-17 dBm
in PCF **S 200/230** Transmission rate "reduced" Transmission rate "default"	 - -17 dBm	 - -	 - -
in plastic fiber **S 980/1000** Transmission rate "reduced" Transmission rate "default"	 -9.5 dBm -5 dBm	 - -	 - -
Sensitivity receiver	-25 dBm	-28 dBm	-29 dBm
Override limit receiver	-3 dBm	-3 dBm	-3 dBm
Bridgeable distance [3]			
with glass fiber **E 10/125** (0.5dB/km)	-	-	0..15 km
with glass fiber **G 50/125** (3dB/km @850nm, 1dB/km @1300nm)	-	0..3 km	0..10 km
with glass fiber **G 62.5/125** (3.5dB/km @850nm, 1dB/km @1300nm)	-	0..3 km	0..10 km
with PCF **S 200/230** Transmission rate "reduced" Transmission rate "default"	 - 0..400 m	 - -	 - -
in plastic fiber **S 980/1000** (0.2dB/m) Transmission rate "reduced" Transmission rate "default"	 0..50 m 30..80 m	 - -	 - -
Connector	BFOC/2.5		
Electromagnetic compatibility			
Noise emission field	EN55022, limit value class A		
Noise emission line	EN55022, limit value class A		
Electrostatic discharge (ESD)	EN61000-4-2, ± 6 kV contact discharge		
HF irradiation	EN61000-4-3, 10 V/m 80 MHz..1 GHz		
HF inlet	EN61000-4-6, 10 V 10 kHz..80 MHz		
Burst	EN61000-4-4, ± 2 kV on powersupply, signaling contact and RS-485		
Surge (surge voltage) (with Blitzductor)	EN61000-4-5, on powersupply lines ± 1 kV balanced ± 2 kV unbalanced on RS-485 bus lines ± 2 kV unbalanced		

[3] The distances between two OLMs may not be exceeded, independently from the optical power balance.

Characteristics	Device type
Voltage interruption Voltage raids	EN61000-4-11, voltage reduction by >95% for 5 s voltage reduction by 30% for 10 ms voltage reduction by 60% for 100 ms and 1000 ms
Climatic ambient conditions	
Ambient temperature during operation	-20 °C..+60 °C for OLMG12-EEC 0 °C..+60 °C for all other OLMs
Storage and transport temperature	-40 °C..+70 °C
Relative air moisture	100%, condensing for OLMG1x-EEC <95%, not condensing for all other OLMs
Mechanical ambient conditions	
Swing operation	10..58 Hz, 0.075 mm deflection 58..150 Hz, 1 g acceleration
Swing transport	5 Hz..9 Hz, 3.5 mm deflection 9 Hz..500 Hz, 1 g acceleration
Vibration in operation	150 m/s², 11 ms period
Shock in operation	150 m/s², 10 ms
Shock packed	250 m/s², 6 ms
Free fall unpacked	10 cm
Free fall packed	30 cm in product packaging 1 m in shipping packaging
Miscellaneous information	
Degree of protection	IP40
Dimensions	39.5 x 110 x 72.2 mm
Housing material	stainless steel, 1,4016
Weight	approx. 320 g
Silicone	the device is free of silicone

Table 4-1 Overview of the product characteristics

4.2 Installation

4.2.1 Safety related notices

Only use the PROFIBUS OLM in the way intended in this operation manual.
Especially observe all warnings and safety relevant notices.

Run the modules only with a safety extra-low voltage of a maximum of +32 V (typically +24VDC) according to IEC 950 / EN 60 950 / VDE 0805. According to the UL/CSA-approval, the power supply unit has to meet the requirements of the NEC, Class 2. Protective measures must be taken to avoid the rated voltage of the equipment being exceeded by more than 40% by transient overvoltages. This is the case if the equipment is supplied exclusively by SELV circuits. Only the supplied connectors may be used for the electrical connection of the OLM, also in cases of spare parts. When using the existing connectors (e.g. OLM V3), the proper contact can not be guaranteed because of different pin diameters! The supplied connectors must also be plugged to get the IP40 protection.

WARNING: If temperatures in excess of 70°C occur on the cable or at the cable feed-in point, or the temperature at the branching point of the cables exceeds 80 °C, special measures need to be taken. If the equipment is operated at an ambient temperature of 50°C - 60°C, use cables with a permitted operating temperature of at least 80 °C.

Observe the electrical limit values when connecting voltage to the reporting contacts: 50 VDC, 30 VAC(CE) / 30 VDC, 30 VAC(cULus). The connected voltage must also be a safety extra-low voltage according to IEC 950/ EN 60 950/ VDE 0805 and has to meet the requirements of the NEC, Class2 in accordance with the UL/CSA approval.

DANGER: Never connect the PROFIBUS OLM to mains voltage.

Choose the assembly place so that the climatical and mechanical limit values, given in the technical data, can be met.

WARNING : All PROFIBUS OLMs are approved for the operation in the explosive area zone 2 according to EEx nC [L] IIC T4. The modules shall be installed in a suitable enclosure providing a degree of protection of at least IP54 according to EN 60529, taking into account the environmental conditions under which the equipment will be used. It is necessary to use the supplied connectors for this case of operation.

Note: If the PROFIBUS OLM are supplied via extensive 24V supply lines or networks, actions against the injection of strong electro magnetic pulses into the supply lines have to be taken. These can occur for example by lightning strike or switching of heavy inductive loads. The robustness of the PROFIBUS OLM against electromagnetic interference is amongst others verified by the “Surge Immunity Test” according to EN61000-4-5. For this test, an over voltage protection for the voltage supply lines is necessary. For example the Dehn Blitzductor VT AD 24V Art. No. 918402 or an equal protection element are suitable. Manufacturer: DEHN+SÖHNE GmbH+Co.KG Hans Dehn Str.1 Postfach 1640 D-92306 Neumarkt, Germany

Note: The available optical radiant power of the used components is not dangerous at all, if the circumstances are sensibly predictable circumstances and they meet the requirements for class 1 according to IEC 60825-1 Ed.1.2:2001-08. Nevertheless, avoid looking directly into the transmitter or into the end of a fiber-optic cable.

4.2.2 General information on the commissioning

Unpack the OLM V4.0 and its accessories and check on completeness and potential transport damage. After unpacking, the device should be acclamatized for an appropriate time to avoid condensation after to storage in cold surrounding.

At first choose the network topology suitable for your requirements. Subsequently the modules will be commissioned in the following steps:

- Checking and if necessary adjustment of the DIL switches.
- Installation of the modules.
- Connection of the voltage supply and if necessary connection of the signaling contacts.
- Connection of the RS 485 bus line with installed bus connection plug (in case of bus topology it has to be observed, that the terminating resistances in the connectors are switched on).
- Connection of the optical bus lines.

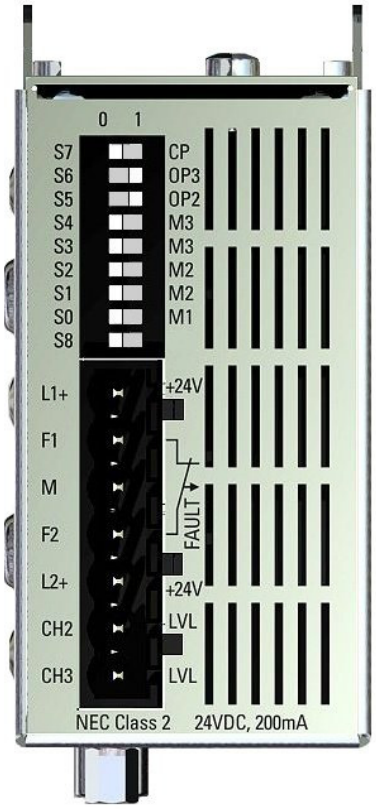


Figure 4-1 View module OLM from top

Position of the DIL switches and of the connection block for the operation-voltage supply/signaling contacts/level recording. The figure shows the factory-made setting of the DIL switches (switches S0, S1, S2, S3, S4, S7 und S8 in position “0”, switches S5 and S6 in position “1”).

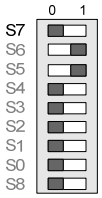
4.2.3 Setting of compatibility, operation mode and transmission rate

Please observe:

The OLM must be switched off when changing the operation mode. You can achieve this for example by pulling the 5-pin terminal block.

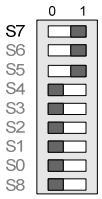
4.2.3.1 Setting the compatibility

With DIL switch S7 the functional compatibility with devices of the prior generation SINEC L2FO OLM/P3, -P4, -S3, -S4, S3-1300 and S4-1300 is switched on or off. The default setting of S7 is position 0 (compatibility switched off).



DIL switch S7 (compatibility) in position 0:

Compatibility to SINEC L2FO OLM/P3, -P4, -S3, -S4, -S3-1300, -S4-1300 **switched off**



DIL switch S7 (compatibility) in position 1:

Compatibility to SINEC L2FO OLM/P3, -P4, -S3, -S4, -S3-1300, -S4-1300 **switched on**

With **DIL-switch S7=1** the **functionality compatibility** to optical link modules SINEC L2FO OLM/P3, OLM/P4, OLM/S3, OLM/S4, OLM/S3-1300 and OLM/S4-1300 **is switched on**. This operation mode is necessary for the mixed operation of these modules with the OLM V4.0. Only switch the S7 switch into position 1, if the PROFIBUS OLM is used as replacement or extension device in existing networks with SINEC L2FO OLM and a direct optical connection shall be achieved. For the interconnection of OLM V3 and OLM V4.0, the switch S7 has to be in position 0 because these devices are directly compatible.

The meanings of the DIP switches concerning the compatibility mode are described in Table 4-2.

In the following the meaning of the DIP switch of the OLM at S7=1 for:					
SINEC L2FO OLM/P3 and OLM/P4			SINEC L2FO OLM/S3 and OLM/S4, OLM/S3-1300 and OLM/S4-1300		
S6	Output Power CH4		S6	Reserved	
0	Standard				
1	High				
S5	Output Power CH3		S5	Reserved	
0	Standard				
1	High				
S4	Reserved		S4	Reserved	
S3	Reserved		S3	Distance	
			0	Extended	
			1	Standard	
S2	Redundancy		S2	Redundancy	
0	Off		0	Off	
1	On		1	On	
S1	Mode	Monitor	S1	Mode	Monitor
0	Line/Ring	On	0	Line/Ring	On
1	Line	Off	1	Line	Off
S0	Reserved		S0	Reserved	
S8	Reserved		S8	Reserved	
OLM/P3: S6 reserved			OLM/S3, OLM/S3-1300: S2 reserved		

Table 4-2 DIL-switch in compatibility mode

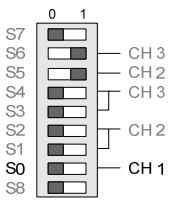
4.2.3.2 Setting the operation mode

Notice! The following information is only valid for the default setting of S7 (S7 = 0), this means compatibility is switched off!

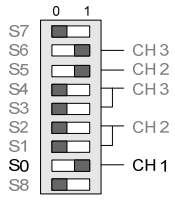
The operation mode of the electrical channel **CH1** is set with the DIL switch **S0**. The operation mode of the optical channel **CH2** is set with the DIL switches **S1 and S2**. The operation mode of the optical channel **CH3** is set with the DIL switches **S3 and S4**. If the OLM has only one optical interface, S3 and S4 have no function.

4.2.3.3 Setting the operation mode of the electrical channel (CH1)

Operation mode "electrical channel with segment monitoring"



CH1 is set to this mode, when S0 is in position 0.



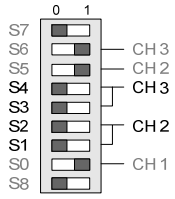
Operation mode "electrical channel without segment monitoring"

CH1 is set to this mode, when S0 is in position 1.

Note: Observe that this operation mode should only be set in the star segment of the star topology.

4.2.3.4 Setting the operation mode of the optical channels (CH2, CH3)

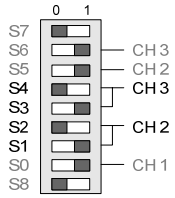
The operation mode can be set seperately for each optical channel. Combinations of the operation modes "bus with and bus without fiber-optic cable distance monitoring" are possible. Observe that the operation mode of the two optical channels, which are connected via the fiber-optic cables, must always be set identically! Both optical channels must always be set to the operation mode "redundant optical ring".



Operation mode "bus with fiber optic cable distance monitoring and segmentation"

CH2 is set to this mode, when S1 and S2 are in position 0.

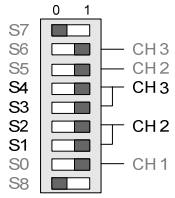
CH3 is set to this mode, when S3 and S4 are in position 0.



Operation mode "bus without fiber-optic cable distance monitoring"

CH2 is set to this mode, when S1 is in position 1 and S2 is in position 0.

CH3 is set to this mode, when S3 is in position 1 and S4 is in position 0.



Operation mode "redundant optical ring"

CH2 is set to this mode, when S1 and S2 are in position 1.

CH3 is set to this mode, when S3 and S4 are in position 1.

Note: Observe that the operation mode must always be set at both optical channels of a module.

4.2.3.5 Reducing the optical transmission rate at OLM/P11 and OLM/P12

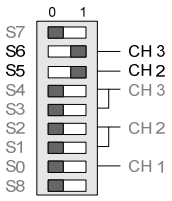
Notice! The following information is only valid for the default setting of S7 (S7=0)!

The OLM/P11 and OLM/P12 have a high optical transmission rate. The connection of these modules with non-OLM-devices via plastic fiber-optic cables can lead to optical override, especially if short cables are used. In this case, the optical transmission rate can be reduced by approx. 60% (3.8 dB).

The transmission rate of **CH2** is set with the DIL switch **S5**.

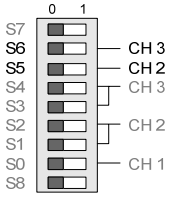
The transmission rate of **CH3** is set with the DIL switch **S6**.

In the case of OLM/P11, S6 has no function.



Leave S5 in position 1 (default), if the fiber-optic cable at CH2 works correctly in this position.

Leave S6 in position 1 (default), if the fiber-optic cable at CH3 works correctly in this position.



Set S5 to position 0 (reduced), if an override of a non-OLM-device occurs at CH2 when plastic fiber-optic cables are used.

Set S6 to position 0 (reduced), if an override of a non-OLM-device occurs at CH3 when plastic fiber-optic cables are used.

Note:

In the case of glass fiber-optic cables, the DIL switches S5 and S6 have no function (reduction of the optical transmission rate not possible).

If PCFs are used, the transmission rate must be set to default (S5 or S6 in position 1).

If the OLM/P11 or the OLM/P12 is used with devices, whose transmission rate is too high, the use of a fix attenuator may be necessary.

5 Installation and Maintenance

5

5.1 Installation

5.1.1 Installation instructions

Electromagnetic Compatibility

The electromagnetic compatibility comprises all questions on electric, magnetic and electromagnetic emission effects. To avoid disturbing influences on electrical installations, these effects have to be cut down to a minimum. Crucial limitation actions are the constructive setup and the professional connection of bus-lines as well as the clearing of faults at switched inductances. See also the notice in chapter 4.2 (protective actions against lightning strike).

Clearance of faults at switched inductances

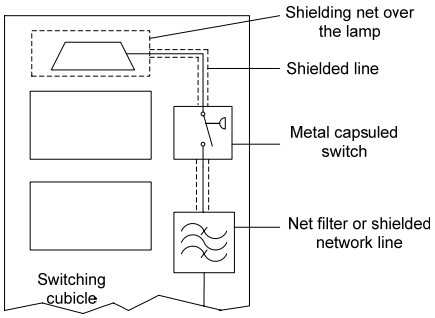


Figure 5-1 Actions against faults of luminescent lamps in the cubicle

- Connect switched inductivities to deletion parts. The switching of inductivities, e.g. relais and fans, produces distortion voltages, who are by far higher than the switched operation voltage. These distortion voltages can influence electronical devices. The distortion voltages of inductivities have to be limited at the emission source by switching of deletion parts (diode or RC switching). Only use means of clearance, which are intended for the use with your relais or fans.
- Switching cubicle illumination

  Use light bulbs for the switching cubicle illumination, e.g. LINESTRA lamps. Avoid the use of luminescent bulbs because the produce distortion fields. If it can not be avoided to use luminescent lamps, the measures described in Figure 5-1 have to be taken.

Layout of devices and lines

- Reducing disturbing influences by means of distance

  A both simple and effective possibility to reduce disturbing influences,is the spacial separation of the disturbing and the disturbed device or line. Inductive and capacitive disturbances decrease by the square of the distance between the involved elements. This means the doubling of the distance reduces the disturbing effects by the factor 4. If layout aspects are taken into consideration, already in the planning of a building or a switching cubicle, they can usually be realized very cost effective.

Please observe:

In between an OLM and a load switching element (e.g. contactor, relais, temperature control, switch, etc.) a minimum distance of 15 cm has to be kept. This minimum distance is to be measured between the outside edges of the components and must be kept in all directions around an OLM. The power supply lines (24 VDC) of the OLM may not be passed in the same cable duct with load carrying lines (load circuits).
The lines +24 VDC and GND should be twisted with each other.

- Recommendations on the spacial setup of devices and lines with the aim to achieve the lowest mutual influences possible, is given in EN 50174-2.
- Dealing with bus line shieldings. Observe the following actions when shielding lines:

  - Use completely shielded SIMATIC NET PROFIBUS lines. The shieldings of these lines have enough coverage to meet the legal requirements for disturbing influences and effects.

  - Always connect the shieldings of bus lines on both ends. Only by connecting the shieldings of the bus lines on both ends you can meet the legal requirements for disturbing influences and effects for your installation (CE mark).

  - Fix the shielding of the bus line at the connector housing or at the corresponding cable clamps.

  - In stationary use, it is recommended to strip the insulation of the shielded line without damaging it and to connect it to the shielding/grounding rail.

  Note:

  In case of potential differences between the grounding points, an unduly high compensating current may flow through the shielding connected at both ends. By no means disconnect the shielding of the bus line to solve the problem.
  The following solution is permissible.
  Pass an extra potential compensation line parallelly to the bus line, which can then take up the shielding current.

Design of shielding connections

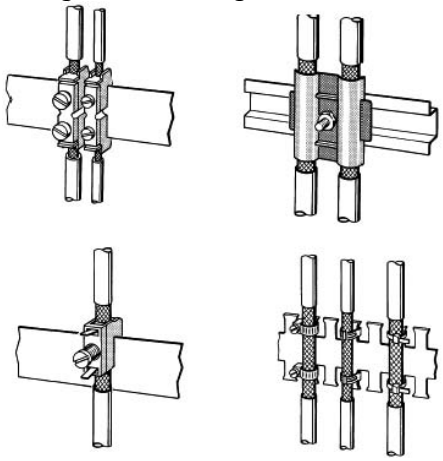


Figure 5-2 Fixing of shielded lines with cable clamps and cable retainers (schematic image)

Please observe the following points when connecting line shieldings:

- Fix the shielding bundles with cable clamps made of metal.
- The clamps must enclose the shielding on a large area and make good contact (see Figure 5-2).
- Only connect the SIMATIC NET PROFIBUS shieldings via the copper-bundle shielding and not via the aluminum-foil shielding. The foil shielding is put on one side of a plastic foil to increase the tensile strength and therefore is not conductive!
- The shieldings of all lines, which come from the outside into a switching cubicle, have to be grounded on a large area at the entrance to the switching cubicle housing.
- The shielding meshwork of the lines must not be damaged when stripping down the

line mantle. Tin-plated or galvanically stabilized surfaces are perfect for a good contact between grounding elements. In case of tin-plated surfaces, the necessary contacts have to be assured by corresponding screwing. Coated surfaces at the contact points are inapplicable.

- Shielding contacts may not be used as strain relief. The contact to the shielding rail could decrease or tear off.

Optical level budget, deterioration and environmental requirements

When using OLM V4.0 devices it should be observed that they are not exposed to high temperatures without important cause. The deterioration of the devices increases radically through high temperatures. Similar comes true for the fiber-optic cables that are to be connected. They deteriorate faster under the influence of temperature and high humidity. The deterioration effect caused by humidity especially comes true for plastic fiber-optic cables.

The described deterioration of devices and fiber-optic cables is made up by the system reserve. This derives from the difference between the receiver sensitivity and the minimum fed-in optical power (see chapter 4.1) as well as from the cable attenuation, that derives from the maximum bridgeable distance.

Example:

OLM/G12, wavelength 850 nm, fiber 62.5/200 µm

P_{send}= 13 dBm

$P_{receiver}$= 28 dBm

optical level budget = 28 dBm-13 dBm= 15 dBm

max. line length = 3 km

attenuation = 3.5 dB/km @850 nm

max. line attenuation = 3.5 dB/km * 3 km= 10.5 dB

system reserve = optical level budget – max. line attenuation

= 15 dBm – 10.5 dBm= 4.5 dBm

This system reserve may not be used by the user, because it may lead to errors at the optical interface!

Furthermore it has to be observed, that the maximum line length are only valid for uncut lines. If optical couplings are used in the configured installation, its attenuation has to be added to the line attenuation.

5.1.2 Connection of the optical lines

Figure 5-3 View of the module bottom with the optical channels 2 and 3 (devices with two optical channels)

- Connect the single modules via a two-core fiber-optic cable with BFOC/2.5 connectors.
- Observe
  – that the end planes of the optical connectors are dirt-free.
  – that always one optical input ⊖ and one optical output ⊕ are interconnected ("cross connection"). The corresponding BFOC jacks of a channel are marked on the lower end plane.
  – that the optical connector is correctly interlocked on the BFOC jack (bajonett conector must be locked).
  – that the BFOC connector head completely intrudes into the fiber-optic cable jack in case of monomode fiber-optic cables. If necessary provide a safe contact by pushing the connector into the jack at the bend-protection cover.
- Assure a sufficient strain relief of the fiber-optic cable and observe the minimal bending radii of the fiber-optic cables (see notice below).
- Seal vacant BFOC jacks with the supplied protective caps (note: A vacant optical channel should be set to operation mode "bus without fiber-optic cable distance monitoring" so that it does not lead to a fiber-optic cable break signalization). Incoming external light can disturb the network, especially in case of high brightness of the vicinity. Intruding dust can destroy the optical components.
- Observe the maximum length of the fiber-optic cables and the possible fiber types, given in the table 2-1, S. 4 and in the technical data, chapter 4.1.
- Test the quality of the line by means of the recording jack, after the installation of the optical network. The recorded values must lie in the permissible range according to chapter 5.6.

Note

The passing of fiber-optic cables demands special measures. Mechanical stress such as traction, pressure or buckling must be avoided. The cable manufacturers give minimal bending radii for the passing and the operation of fiber-optic cables. The bending radii and the passing requirements strongly depend on the cable type used and therefore have to be looked up in the directives of the corresponding data sheet. Not meeting the requirements may lead to higher attenuation values and in the worst case (extreme bending) to the destruction of the fiber-optic cable.

5.2 Installation of the modules

Installation possibilities

The OLM modules can either be mounted on a 35 mm rail according to DIN EN 50022 or a plane surface by means of a mounting plate.

- Choose the assembly place so that the climatical and mechanical limit values, given in the technical data, can be met.
- Observe that there is enough space for the connection of the bus and voltage supply lines.
- Connect the fiber-optic cables before the installation of the modules. This makes it easier to connect the fiber-optic cables.
- Only install the modules on a rail or a mounting plate, which is grounded with minimum resistivity and minimum inductivity. Beyond this, no further grounding measures need to be taken.

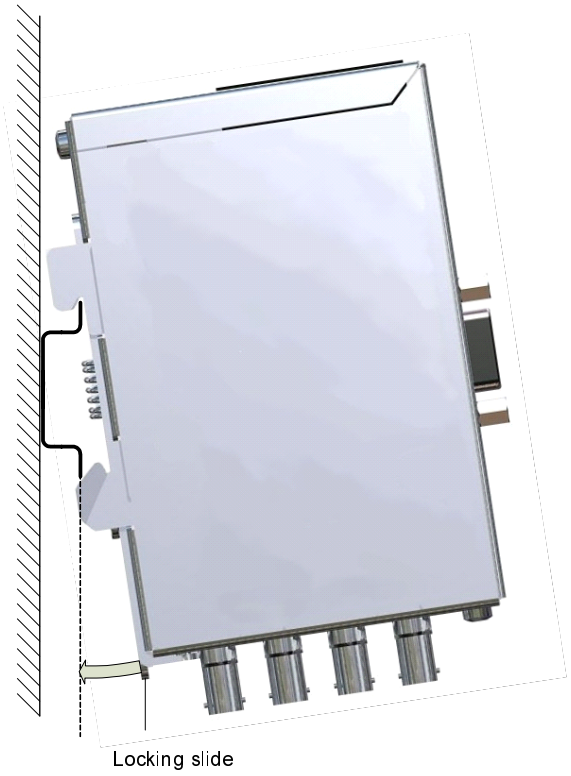


Figure 5-4 Installation of a module on a standard rail

Installation on a rail

- Hang the upper locking hooks into the rail and push the lower side onto the rail, as shown in
- Figure 5-4, until it interlocks audibly. To uninstall the module, pull the locking slide downward.

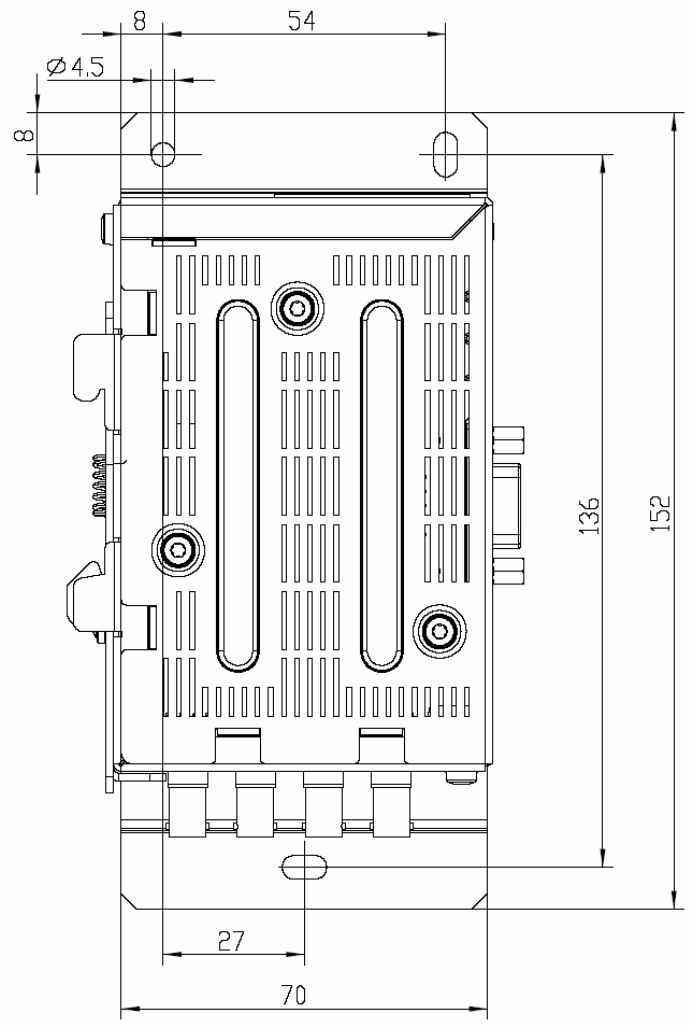
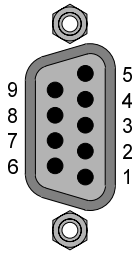


Figure 5-5 Installation of a module with a mounting plate

Installation on a mounting plate

- Fix the module to the mounting plate with 3 screws M3x8 (accessories, Order-No. A2B00065949), torque 0.8 Nm.
- Fix the mounting plate at the desired installation position.
- Assure a safe and permanent electrical connection between mounting plate and surface by using lock washers for example.

5.3 Connection of the electrical RS 485 bus lines



Pin	Assignment
3	RxD/TxD, P
8	RxD/TxD, N
5	Ground
6	+5V Output
4	RTS
1, 2, 7, 9	vacant

Figure 5-6 Electrical port, connection assignment Sub-D jack

The modules are equipped with an electrical port with RS 485 level. It is designed as 9-pin Sub-D jack with screw interlocking (inside thread UNC 4-40).
The pin assignment corresponds with the PROFIBUS standard assignment. A short-circuit proof 5 V output for the supply of external pull-up/pull-down resistances is available at pin 6. The resistances have to have a power loss of at least 0.25 W. The RS 485 bus lines RxD/TxD, N and RxD/TxD, P are galvanically separated against the 24 V supply voltage within the SELV limits (functional separation).
The RS 485 interface is galvanically connected with the housing.

- Only use shielded and twisted two-wire lines as RS 485 bus lines as described in the manual “SIMATIC NET PROFIBUS networks”. Do not exceed the segment dimensions given there.
- Connect the RS 485 bus segment via a PROFIBUS connector. If the module is positioned at the beginning or at the end of a bus segment, this connector needs to have a switched on bus termination resistance combination.

- All PROFIBUS bus connectors of the network have to be screwed tight to the RS485 interfaces.
- Connecting or pulling the bus connector or loosely connected bus connectors or not tightly screwed bus cores inside the connectors can lead to distortions in the optical and electrical network.
- Connect or pull the RS 485 bus connector quickly and without tilting the connector.
- Disconnect the RS 485 bus line from the OLM when there is no device at the other line end or when it is currentless. Otherwise the open line acts like an antenna and can inject distortions.
- In order to minimize disturbing influences, stick to the following order when connecting a RS 485 bus line to a PROFIBUS OLM when the network is active:

  1. Plug the RS 485 bus connector onto the corresponding device (e.g. the programming device) and screw it tightly.

  2. Connect the RS 485 bus connector quickly and without tilting of the connector to the PROFIBUS OLM.
  Carry out the steps in reverse order when disconnecting a device from the network.
- Make sure that the bus segment, which is connected to the RS 485 interface, is terminated at both ends. Only use a connection line, which is terminated on both ends, to connect a single device.

Compatibility notice:

In the case of OLM V3, pin 2 was additionally connected with ground and pin 1 with shielding. This is not conform with the corresponding standard EN 50170 /2/. This is no problem, when standard-conform PROFIBUS lines are used. In the case of installation into existing wiring, the pin assignment has to be checked and modified if necessary.

Please observe to the following safety notice:

Do not connect RS 485 bus lines to the OLM, which are completely or partly passed outside of buildings. Or else lightning strikes in the vicinity can lead to the destruction of the modules. Realize bus connections which leave the building with fiber-optic cables!

5.4 Connection of the operation voltage supply

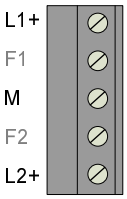


Figure 5-7 Operation voltage supply, pin assignment 5 pin terminal block

The terminal block can be pulled off the device for the connection of the lines.

- Supply the module only with a stabilized safety extra-low voltage of a maximum of +32 V (typically +24V) according to IEC 950 / EN 60 950 / VDE 0805. According to the UL/CSA-approval, the power supply unit has to meet the requirements of the NEC, Class 2. This can be fed via the 5 pin terminal block at the upper side of the module.
- To increase the operation safety, the module can redundantly be supplied via the clamps L2+/+24 VDC* and M. When the regular supply voltage breaks down, the module automatically switches to the redundant operation voltage supply. There is no load splitting between the single supply possibilities. The signaling contact does not signalize the break down of a single 24 V feed. For monitoring purposes, the two feeds, as well as the signaling contact, have to be connected to a input module.

Lugs at the terminal block assure a secure connection to the device and avoid a wrong pole connection.

5.5 Connection of the signaling contact lines

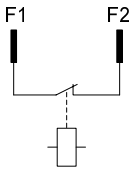


Figure 5-8 Signaling contact relais with floating contacts; In case of error, the contact is open

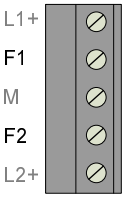


Figure 5-9 Signaling contact, pin assignment 5 pin terminal block

The terminal block can be pulled off the device for the connection of the lines.

A relais with floating contacts can be used as signaling contact and is available at the 5 pin terminal block at the upper side of the module. By means of this relais, faults of the network and of the modules can be signalized. In case of error, the contact is open. Thus a complete voltage break down is signalized, too.

The faults signalized by the signaling contact can be found in chapter 5.7. Limit values of the signaling contact:

– maximum switching voltage 50 VDC; 30 VAC

– maximum switching current 1.0 A

The voltage connected to the relais must be a safety extra-low voltage according to IEC 950/ EN 60 950/ VDE 0805 and has to meet the requirements of the NEC, Class2 in accordance with the UL/CSA approval.

- Connection assignment 5 pin terminal block:

  Clamp F1 and F2.
- Please pay utmost attention to correct connection assignment of the 5 pin terminal block. Assure a sufficient electrical insulation of the connection lines of the signaling contacts, especially when they operate with voltages higher than 32 V. A wrong assignment can lead to the destruction of the modules.

5.6 Receiving level of the optical channels

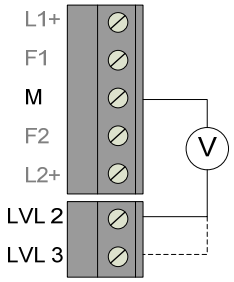


Figure 5-10 Position of the level recording connections

The input level of the two optical channels CH2 und CH3 can be detected by means of a standard volt meter via the recording jacks. The volt meter can be connected and disconnected during running operation. The OLM is protected against a short circuit at the recording jacks, the data transmission will not be influenced.

Thus

– the incoming optical rate can be documented, e.g. for later recordings (deterioration, damage)

– a good/bad test can be carried out (limit value).

The recording has to be carried out by means of a high resistance, ungrounded volt meter. The ground connection must not be connected with the housing, otherwise the data traffic could be disturbed. To meet the EMV requirements, the length of the connected recording lines may not exceed 3m. The quality of the bus traffic can be estimated by means of the receiving levels in the following diagram:

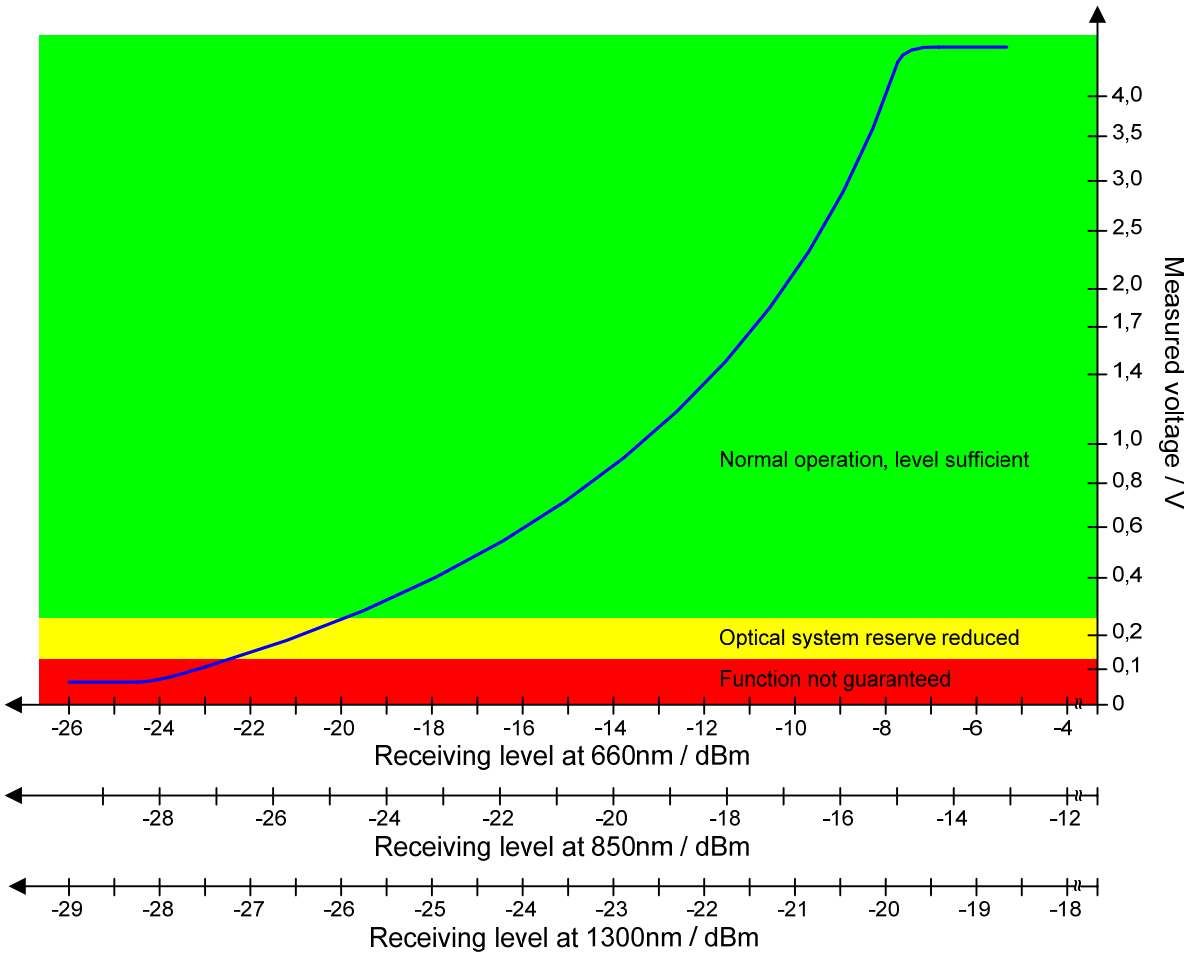


Figure 5-11 Assignment recorded output voltage to signal quality

Note:

For a valid recording value it is necessary, that the partner OLM at the other end of the fiber-optic cable sends regular PROFIBUS telegrams. This can be detected by means of the LED display of the partner OLM (see chapter 5.7.1).

The output voltages at the the recording jacks are influenced by many factors:

- strength of the transmission rate of the partner OLM
- vicinity temperature of the optical transmitter and receiver
- attenuation of the transmission line
- used transmission rate

Thus the recording jacks are not intended as substitute for a calibrated level recording device with calibrated light source. The displayed value only serves for the classification of the received optical signals into 3 classes:

- good (normal operation, green) 5V > U > 240 mV
- critical (optical system reserve reduced, yellow) 120 mV ≤ U ≤ 240 mV
- bad (functionality not guaranteed, red) U < 120 mV

The recording has to be carried out with a standard ungrounded and high resistance volt meter. The inside resistance of the recording jacks is approx. 30 kΩ. Neither the connection of the recording jacks nor the connection of the ground to the OLM housing is permissible.

For connection to an OLM of the SINEC L2FO range, the OLM V4 LED level indicator has no meaning. The measuring sockets cannot be used.

5.7 LED displays and error search

5.7.1 LED displays

Figure 5-12 LED displays at the front plate

Note:

The LED between “SYSTEM” and “CH 1” is not in use and not lit.

LED display		Possible causes	Signaling Contact
System	■ lit green	- The transmission rate was detected and the voltage supply is ok	does not signalize
	□ not lit	- Voltage supply broken down (complete break down, this means in case of redundant supply, break down of both supply voltages) - Voltage supply connected wrongly - Module defective	signalizes
	▣ blinks red	Transmission rate not detected yet - There is no transmitting bus participant - No connection to a telegram-sending partner module - Transmitting and receiving fiber-optic cable are connected interchanged - Transmission rate does not correspond with the PROFIBUS standard - Only one single bus participant is connected, which only sends token to itself. After activation of a second bus participant, the display has to change (token telegrams are not enough to adjust the transmission rate) - The connected RS 485 segment is only terminated at one side	does not signalize
	▣ ▣ blinks red/green	Transmission rate detected but - The slot time of the network could not be detected yet (network parameter HSA set too low, there is no transmitting bus participant) - One optical channel is set to “redundant optical ring“ mode but the second one is not (this operation mode must always be set at both optical channels) - The slot time of the network is set to a too low value	does not signalize does not signalize
CH1, electrical	■ lit yellow	Signals are received on the RS 285 bus lines.	does not signalize
	□ not lit	Bus participant is not connected, does not signalize -Connected bus participant is not connected - Interruption of one or both cores of the RS 485 bus line	does not signalize
	■ blinks red/lit red	Sporadic disturbances because of - Insufficient shielding of the RS 485 bus line - Open bus line, this means the RS 485 bus line is only connected at one side - RS 485 segment is not terminated or nly at one side - Pulling/connecting a RS 485 bus terminal or terminating plug Permanent error because of - Cores A and B of the RS 485 bus line are connected interchanged - Short circuit at the RS 485 bus line - Transmission time exceeding caused by a bus participant which is positioned in a bus segment connected to channel 1	signalizes
		-Module and other bus participant, connected at channel one, transmit at the same time (e.g. because of double addresses or too low slot time or during clearing of the segmentation in the optical line, see chapter 3.1.1) - RS 485 driver of the module defective (e.g. after lightning strike)	does not signalize
CH2, CH3 optical		**Operation mode “Bus with fiber optic cable distance monitoring” and “redundant optical ring“**	
	■ lit yellow	PROFIBUS telegrams are received on the optical channel	does not signalize

LED display		Possible causes	Signaling Contact
	☐ not lit	Transmission rate not detected yet – LED “System“ blinks red - There is no transmitting bus participant - Transmitting and receiving fiber-optic cable are connected interchanged -No partner module connected or partner module is not active - Connected partner module is defective Transmission rate is detected – LED “System” is lit green - When the operation mode “redundant optical ring“ is set, the optical channel operates as standby channel. There is no error in the OLM or in the fiber-optic cable. - If one of the operation modes “bus with fiber-optic cable distance monitoring...“ is set, no telegrams are received on the optical PROFIBUS channel. There is no error in the OLM or in the fiber optic cable.	does not signalize
	☐ blinks yellow	Transmission rate is detected – LED “System” is lit green or blinks red/green - There is no transmitting bus participant (fiber-optic cable connection is ok)	does not signalize
	■ lit red	- Transmitting and receiving fiber-optic cable are connected interchanged - No partner module connected or partner module is not active - Connected partner module is defective - Transmission time exceeded by the connected partner module - Interruption of a fiber-optic cable - Fiber-optic cable to the partner module longer than permitted - Loose contact at a fiber-optic cable connector - Fiber in the fiber-optic cable is loose - When the channel LED of the two concerned OLMs keeps on gleaming red after the clearing of a fiber-optic cable fault in the redundant optical ring check, if the setting of the parameter HSA, described in chapter 3.3 is correct	signalizes
	■ ☐ blinks red/yellow	- Periodically occuring error (see above) loose contact at a fiber-optic cable connector - Fiber in the fiber-optic cable is loose - Only one single bus participant is connected, which only sends token to itself. After the activation of a second participant there must be no more error display	signalizes
		Operation mode “bus without fiber-optic cable distance monitoring”	
	■ lit yellow	PROFIBUS telegrams are received on the optical channel	does not signalize
	☐ Not lit	- There is no transmitting bus participant - Transmitting and receiving fiber-optic cable are connected interchanged - No partner module connected or partner module is not active - Connected partner module is defective	does not signalize
CH2, CH3 Level	■ Lit green	Receiving level sufficient, normal operation	not relevant
	■ lit yellow	Receiving level critical, system reserve reduced	
	■ Lit red	Receiving level insufficient, function not guaranteed	

Table 5-1 Meaning of the LED displays and signalization via the signaling contact

5.7.2 Error search

This chapter will help you to localize the error after an error message (LED or signaling contact). Thus also observe the discription of the LED displays in chapter 5.7.1.

5.7.2.1 Error display at the System LED

See description of the LED displays in chapter 5.7.

5.7.2.2 Error display at CH1

Check if

- the DIL switch S0 is in position 1, when the OLM is at the electrical star segment of a star topology (see chapter 3.2)
- the error is still existent after pulling the RS 485 connector.

  Still existent: Device defective[4]. Change the OLM.

  Not existent anymore: The error derives from the RS 485 bus segment.

  Check:
  – all RS 485 connectors as described in chapter 5.3
  – the setup and the shielding of the RS 485 bus segment.
  – the RS 485 bus segment by means of the PROFIBUS bus monitor
  – the configuration of all bus participants.

5.7.2.3 Error display at CH2 / CH3

1. **Check if**

- if only modules of the same type are connected with each other optically (see chapter 3),
- the optical fiber is permitted for the used module type and does not exceed the permitted length (see Table 2-1 Number of electrical and optical ports per module,
- the optical channels, which are connected via fiber-optic cables, are set to the same operation mode. (see chapter 4.2.3)
- the ends of the fiber-optic cables and the optical transmission and receiving components are free of dirt
- the fiber-optic cable connectors are connected completely and correctly,
- the requirements of chapter 5.1.2 were met when connecting and passing the optical bus lines.

2. **Detect the optical receiving level (chapter 5.6):**

- Check the fiber-optical attenuation with a optical level meter, if the level is in the area of “function not guaranteed” or “optical system reserve reduced. If the attenuation is too high, exchange the fiber-optical cable. If the attenuation is within the valid area, one of the two OLMs of the distorted segment is defective. At first, exchange the OLM which delivers the signal for the recording mentioned above. If the error remains, exchange the other OLM instead. If there is no optical level meter at hand, a statement can be made by means of a simple change of **both** fiber-optic cables at **both** OLMs: if the error keeps with

[4] Is not valid, in case the monomaster of a PROFIBUS network is connected to the RS 485 bus segment that is to be tested. In this case interchange the conspicious OLM with another OLM of the network and subsequently carry out the test mentioned above.
If the error keeps with the OLM, the device is defective. Change the OLM.
If the error does not keep with the OLM, the disturbance derives from the RS 485 bus segment. Carry out measures as described above.

the changed parts, the reason will most certainly be the fiber-optic cable, or else one of the two OLMs.

- If the level is in the area “normal operation”, first check the transmitting OLM, as described above, and then the receiving OLM, if necessary.
- If the level of **both** OLMs of the disturbed fiber-optic cable segments is within the range “optical system reserve reduced” or “normal operation”, one of the two OLMs of the disturbed fiber-optic cable segment is defective. In this case one OLM of the disturbed fiber-optic cable segment is to be changed first, too. If the error remains, exchange the other OLM instead.

5.7.2.4 Level display is lit yellow or red

For active interfaces see prior chapter 5.7.2.3.

The level display can not be deactivated on general. In case the (correctly) red level display of a not used optical interface shall be changed to green, a short circuit must be produced from the transmitter to the receiver of the concerned channel, via a corresponding fiber-optic cable. At the same time, the monitoring for this channel must be active. This means for channel 2 S1 and S2 are switched off and for channel 3 S3 and S4 are switched off. Thus the channel display (yellow LED) is not lit and the corresponding level LED shows green.

5.8 Maintenance

The OLM V4.0 are maintenance-free. Also no calibrations can be made at the OLM V4.0. There are no elements inside the OLM V4.0 housing which are to be touched by the installer or user. The only adjustment elements are the DIL switches which are accessible from the outside.

The devices have a self resetting fuse (Resetable Fuse / PTC). **If the fuse blows (all LEDs are off despite correctly applied power supply), the device should be disconnected from the power supply for approx. 30 minutes before it can be turned on again.**

If any different fault develops, please send the device to your SIEMENS service center for repair. Repairs on-site are not possible.

5.9 Cleaning

If a cleaning of the devices becomes necessary, it has to be carried out by means of a dry and smooth cloth. Do not use water or solvent! If liquids get into the device it has to be deactivated.

There must not get any dirt into the optical transmission way or onto the optical components when cleaning the device. This means that the fiber-optic cables need to remain connected or the supplied protective caps need to be put on!

5.10 Configuration

Because of telegram delays due to lines and network components as well as monitoring mechanisms in the network components, the PROFIBUS network parameter “slot time“ has to be adjusted to the network dimension, the network topology and the data rate, when configuring the network.

5.10.1 Configuration of optical bus and star topologies

The configuration of the PROFIBUS network is carried out for example with SIMATIC STEP 7 (V5) or with COM PROFIBUS (V5). Number of OLMs and overall line length can be entered via a entry mask. Check on the configuration tools, if the slot time can be kept in the chosen communication profile. A warning message is given out and the parameters will be adjusted in the case of an exceeding due to additional runtime of OLM and fiber-optic cables.

5.10.2 Configuration of redundant optical rings

The following configuration requirements must be met in the redundant optical ring (see chapter 3.3 for details):

- One vacant address below the HSA (1)
- Increase of the retry value to at least 3 (2)
- Checking and adjustment of the slot time (3)

Use the user-specific configuration tool for the setting of the parameters under (2) and (3). Calculate the slot time by means of the following equation:

$$\text{Slot time} = a + (b * \text{length}_{\text{fiber-optic cables}}) + (c * \text{number}_{\text{OLM}})$$

Slot time	is the monitoring time in bit times
$\text{Length}_{\text{fiber-optic cables}}$	is the sum of all fiber-optic cable lines (segment lengths) in the network. The length must be entered in km!
$\text{Number}_{\text{OLM}}$	is the number of the PROFIBUS OLMs in the network.

The factors a, b and c depend on the transmission rate and can be found in the following table:

Data rate	a	b	c
12 Mbit/s [5]	1651	240	28
6 Mbit/s [1]	951	120	24
3 Mbit/s [1]	551	60	24
1.5 Mbit/s [1]	351	30	24
500 kbit/s	251	10	24
187.5 kbit/s	171	3.75	24
93.75 kbit/s	171	1.875	24
45.45 kbit/s	851	0,909	24
19.2 kbit/s	171	0,384	24
9.6 kbit/s	171	0,192	24

Table 5-2 Constant for the calculation of the slot time at DP-standard (redundant optical ring)

Data rate	a	b	c
12 Mbit/s [1]	1651	240	28
6 Mbit/s [1]	951	120	24
3 Mbit/s [1]	551	60	24
1.5 Mbit/s [1]	2011	30	24
500 kbit/s	771	10	24
187.5 kbit/s	771	3.75	24
93.75 kbit/s	451	1.875	24
45.45 kbit/s	851	0.909	24
19.2 kbit/s	181	0.384	24
9.6 kbit/s	171	0.192	24

Table 5-3 Constant for the calculation of the slot time at DP/FMS (”universal“) and DP with S5 95U (redundant optical ring)

The slot time calculation only considers the optical network and the connection of bus participants to the OLM via a RS 485 bus segment with a maximum length of 20 m each. Longer RS 485 bus segments have to be added by adding them to the length of the fiber optic cables.

Note:

If the value of the slot time is configured too low, errors and error messages of the OLM can occurr. The system LED blinks red/green.

[5] In the case of OLM/G11-1300 and OLM/G12-1300 minimum slot times according to the following table must be met, when the data rates are 12 Mbit/s, 6 Mbit/s, 3Mbit/s and 1.5Mbit/s:

Data rate	Minimum slot time
12 Mbit/s	3800 t_{Bit}
6 Mbit/s	2000 t_{Bit}
3 Mbit/s	1000 t_{Bit}
1.5Mbit/s	530 t_{Bit}

If the calculated slot time is below the minimum slot time, use the minimum slot time according to the table above for the slot time, that is to be configured.

6 Approvals and Marks

6.1 CE-mark

Product name SIMATIC NET

SIMATIC NET OLM/P11 V4.0	6GK1 503-2CA00
SIMATIC NET OLM/P12 V4.0	6GK1 503-3CA00
SIMATIC NET OLM/G11 V4.0	6GK1 503-2CB00
SIMATIC NET OLM/G12 V4.0	6GK1 503-3CB00
SIMATIC NET OLM/G12-EEC V4.0	6GK1 503-3CD00
SIMATIC NET OLM/G11-1300 V4.0	6GK1 503-2CC00
SIMATIC NET OLM/G12-1300 V4.0	6GK1 503-3CC00

EMC directive The SIMATIC NET products above meet the requirements for the following EU directives:

CE

Directive 89/336/EEC

"Electromagnetic compatibility"

Area of Application

The products are designed for use in an industrial environment:

Area of Application	Requirements	
	disturbance emission	disturbance protection
Industry	EN 61000-6-4 : 2001 (replaces EN 50082-2)	EN 61000-6-2 : 2001 (replaces EN 50081-2)
Living and business environment as well as small companies	EN 61000-6-3 : 2001 (replaces EN 50081-1)	EN 61000-6-1 : 2001 (replaces EN 50082-1)

Installation Guidelines

The products meet the requirements if you keep to the installation instructions and safety-related notices as described here and in the "SIMATIC NET PROFIBUS Networks" /1/ manual when installing and operating the device.

Conformity Certificates

The EU declaration of conformity is available for the responsible authorities according to the above-mentioned EU directive at the following address:

Siemens Corporation
Bereich Automatisierungs- und Antriebstechnik
Industrielle Kommunikation (A&D SC IC)
Postfach 4848
D-90327 Nürnberg

Notes for Manufacturers of Machines

The products are not machines in the sense of the EC Machinery Directive. There is therefore no declaration of conformity for the EU directive on machines 89/392/EEC for these products.

If the products are part of the equipment of a machine, they must be included in the procedure for the declaration of conformity by the manufacturer of the machine.

General notice concerning the approvals

The stated approvals are as recently chartered as the corresponding marks are attached.

6.2 c-tick

Canada

Canadian Notice: This Class B digital apparatus complies with Canadian ICES-003.

Avis Canadien Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Australia

This product meets the requirements of the AS/NZS 3548 standard.

N117

6.3 FM approval

CL.1, DIV.2, GP. A,B,C,D, T4
CL.1, Zone 2, GP. IIC, T4
Ta: -20°C...+60°C (model OLM/G12 ECC, only)
Ta: 0°C...+60°C (all other models)

6.4 Ex approval

II 3 G
Eex nC [L] IIC T4
KEMA 06 ATEX 0021 X
EN 60079-15:2003

6.5 UL/CSA approval

c(UL)us LISTED

IND. CONT. EQ.: 91MA

I.T.E.for HAZ. LOC.: 34SM
CLASS 1, DIV. 2 GROUP A; B; C; D T4
CLASS 1, Zone2, GP. IIC, T4
CLASS 1, Zone2, Aex nC IIC, T4

7 References

7.1 References

Sources of Information and Other Documentation

1. SIMATIC NET PROFIBUS networks
   order numbers:
   6GK1970-5CA20-0AA0 German
   6GK1970-5CA20-0AA1 English
   6GK1970-5CA20-0AA2 French
   6GK1970-5CA20-0AA4 Italian
2. EN 50170-1-2 1996: “General Purpose Field Communication System“, Volume 2 “Physical Layer Specification and Service Definition“
3. DIN 19245: “Recording and controlling; PROFIBUS part 3; Process Field Bus; decentralized periphery (DP)”
4. EIA Standard RS–485 (April 1983): “Standard for electrical characteristics of generators“

Glossary

BFOC	Bajonet Fiber Optic Connector
DIN	Deutsche Industrie Norm [German industrial standard]
EEC	Extended Environmental Conditions
EIA	Electronic Industries Association
EN	Europäische Norm [European standard]
EMV (EMC)	Elektromagnetische Verträglichkeit (Electromagnetic Compatibility)
HCS™	Hard Polymer Cladded Silica Fiber (registered trademark of Ensign-Bickford)
HSA	Highest Station Adress
IEC	International Electrotechnical Commission
LED	Light Emitting Diode
OBT	Optical Bus Terminal
OLM	Optical Link Module
PCF	Polymer Cladded Fiber (similar to HCS™)
PNO	PROFIBUS Nutzer Organisation [PROFIBUS user organization]
SELV	Safety Extra Low Voltage
TSDR MIN	Time Station Delay Remote Minimal
UL	Underwriter Laboratories
VDE	Verein Deutscher Elektroingenieure [community of German electrical engineer]

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